A SHORT SURVEY OF THE MORE IMPORTANT FAMILIES OF ACARI.

By Dr. A. C. OUDEMANS.

Mites or Acari belong to the class Arachnoidea, which also contains the Scorpions, the Spiders, the minute False-Scorpions, the long-legged Field Spiders and some other curious eight-legged creatures. They are at present considered as a degenerating branch of the Arachnoid trunk. Their larvæ are six-legged, their nymphs eight-legged, but deprived of genital apertures.

Apart from the Ticks (Ixodoidea), mites have been generally very much neglected by collectors and systematists alike; but seeing that they comprise a considerable number of species of undoubted economic importance, it has seemed desirable to call attention to them by this brief account of some of the more striking forms. A fuller investigation of their habits and life-histories, especially as regards tropical species, is certain to yield much information that is likely to be of both practical value and scientific interest.

The Acari fall into the following natural groups :—

(1) Notostigmata.—A group of most interesting creatures of about two

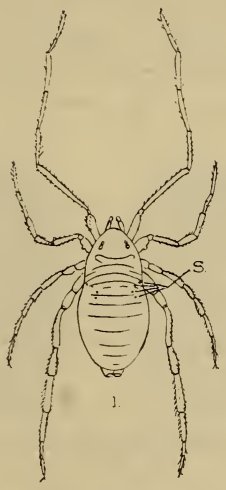

Fig. 1.—*Opilioacarus segmentatus*, With; female; dorsal side; S=stigmata. Copied from With, in Vid. Medd. Nat. Foren. Kjbhvn., 1904, tab. 1.

to three millimetres in length, with hard integument, and resembling somewhat the well known Field Spiders. It is still doubtful whether they are Acari or not. They breathe by four pairs of dorsal breathing-openings or

stigmata (hence their name) in the first, second, third and fourth abdominal segments. The legs on each side are contiguous. Hitherto they have been found only under stones in the circum-Mediterranean countries.—Mites may generally be caught by means of a small moistened paint-brush. They should be preserved in small glass tubes filled with alcohol. Into the tube insert a small label, on which should be noted, with black pencil or Indian ink, the locality, date, collector's name, and the conditions of capture or name of the host.

(2) TETRASTIGMATA, or HOLOTHYREOIDEA, are quickly moving ACARI, with brown, hard and shining integument, and as large as Lady-Birds (COCCINELLIDÆ). The upper surface is formed of a single shield-like plate; hence the name of HOLOTHYREOIDEA.

As is suggested by the alternative name of TETRASTIGMATA, these creatures are characterised by two pairs of dorsal stigmata, of which one pair is situated on the dorsal side, behind the line of insertion of the fourth pair of legs, whilst the other pair lies in the ventrally sufflexed margins of the dorsal shield or carapace, outside of the third pair of legs; being thus apparently, though not really, ventral in position (fig. 2). The legs on each side are contiguous.—Hitherto they have only been found under stones or on the under surface of dead leaves in the following islands: New Guinea, Ceylon, the Seychelles and Mauritius.

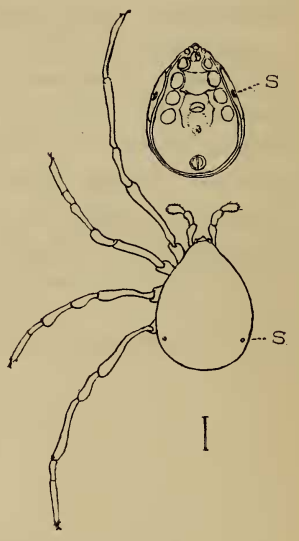

Fig. 2.—*Holothyreus longipes*, Thor.; male; dorsal and ventral side; S = stigmata.—Copied from Thorell, in Ann. Mus. Genova, xviii. 1882, tab. 4.

(3) METASTIGMATA, or IXODOIDEA (Ticks), are generally oval in shape, of varying colours, dorso-ventrally compressed, and slow in their movements; their stigmata lie, with a few exceptions (of which fig. 4 is a good example), behind the fourth pair of legs, as shown in figure 3; hence the name of METASTIGMATA. They occur as parasites, especially on mammals, less often on reptiles and birds, and rarely on toads or large spiders; but they also pass a part of their life free on low herbs, or among dry and decaying leaves.—Ticks are essentially blood-suckers, and their mandibles resemble in some measure a pair of boat-hooks with two or more hooks; they lie in a sheath and can be protruded and retracted. The first joints, or *coxæ*, of the two maxillæ are fused together, forming a flat rasp, which has its teeth on the ventral surface (see fig. 3, underside). The mandibles and maxillicoxæ together form the

rostrum, which is inserted into the host. The four remaining joints of each maxilla form together the (maxillary) palp ; the two palps are more or less excavate on the side toward the rostrum (see fig. 3, ventral side), thus forming a sheath wherein the rostrum is secured during the periods that the

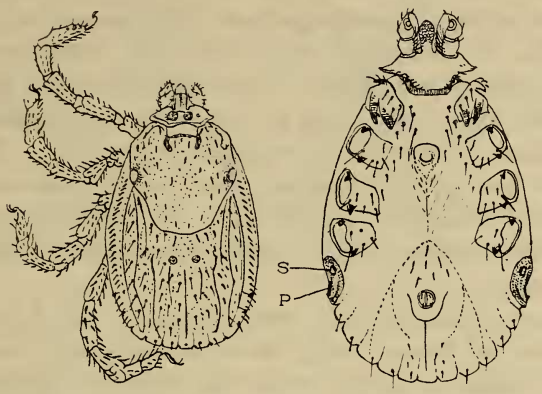

Fig. 3.—*Rhipicephalus sanguineus* (Latr.); female ; dorsal and ventral side ; S=stigma ; P=peritrema.—Original.—**A noxious species.**

creature lives free. The eight legs are stout, ending in two strong claws, and are placed contiguously on each side.—As is shown in fig. 4 (ventral side), the genital aperture lies far forward. During copulation the ventral surfaces of the two sexes are apposed. As soon as the female is impregnated it gorges itself with blood from its host and becomes enormously distended,

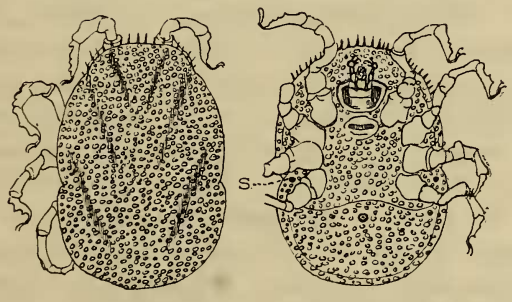

Fig. 4.—*Ornithodorus moubata*, Murray ; female ; dorsal and ventral side ; S=stigma. Copied from Doflein, Protozoaenkunde, 1909.—**A noxious species.**

sometimes even attaining the size of a hazel-nut. It then loosens its hold and falls to the ground, where it seeks shelter under stones, dead leaves, etc., for the purpose of ovipositing. In fig. 3 (dorsal side) it will be observed that the female has on its neck, behind the palps, two dull patches. Out of these patches grow two white or transparent sausage-shaped organs, which

bend over the creature's head towards its genital aperture, where they seize each egg as it is extruded and carry it back over the head to the dorsum. Within a few days the female is thus covered with eggs, and then dies.—The larvæ, as soon as they hatch, climb upon low herbs, till they reach the top of a leaf, to which they cling with their four hind legs, whilst waving their fore legs in the hope of grasping a host.—The Ixodoidea are divided into two families, viz., the Argasidæ (fig. 4) and the Ixodidæ (fig. 3). The former have a leathery and more or less rough skin, and the stigmata lie between the third and fourth pairs of legs. As they attack men by night, they are sometimes mistaken for bed-bugs (Cimicidæ). The true ticks, however, have a hard, smooth, shining, often brightly coloured skin, and the stigmata are behind the fourth pair of legs. The females have only the fore part of the dorsum shielded (fig. 4), while in the males the shield covers the whole upper surface.

From an economic point of view both Argasidæ and Ixodidæ are most noxious creatures, the former being the disseminators of relapsing fever in man and a fatal disease in poultry, while the latter are responsible for about half-a-dozen dangerous diseases affecting various domesticated animals. When the creatures are attached to the skin of a host, a drop of chloroform, or ether, or benzin will soon force them to loose their hold. It is important that all stages of development should be collected, and the ticks from two different hosts should *never* be placed in one tube.

(4) Mesostigmata, or Parasitoidea (Insect-Mites), are generally less than one millimetre in length, oval in shape, yellowish brown in colour, often well chitinised, more or less dorso-ventrally compressed, and more or less quick in their movements. Their breathing-openings, or stigmata, lie between the third and fourth pairs of legs (see fig. 5), hence the name of Mesostigmata. Usually a long air-containing tube, called the *peritrema*, is annexed to the stigma ; its signification is unknown. They prey upon creatures smaller than themselves, especially other Mites, Pauropods, Spring-tails, etc.; so that in many cases they are of direct service to man by destroying other noxious species, such as the mites of the genus *Tetronychus* (see below, p. 113), which cause damage to various cultivated plants. But there are also many species which are parasitic upon birds, bats and other mammals ; *e. g.*, the species, represented in fig. 6, which sucks the blood of fowls and cage-birds. Hence it comes that they live literally everywhere : among dry and decaying leaves, in moss, among grass, upon or beneath the bark of trees, on the under-sides of leaves, on mammals and birds, in groceries, etc. They often use flying insects, such as beetles, bumble-bees, etc., as a means of transport to reach better conditions, and have thus erroneously been supposed to be truly parasitic upon insects.—The mandibles of the predaceous Mesostigmata end in pincers, resembling the claws of a lobster, and can be protruded and

retracted, in the same way as in the METASTIGMATA. Those of the blood-sucking MESOSTIGMATA are lancet-shaped. The mandibles are covered

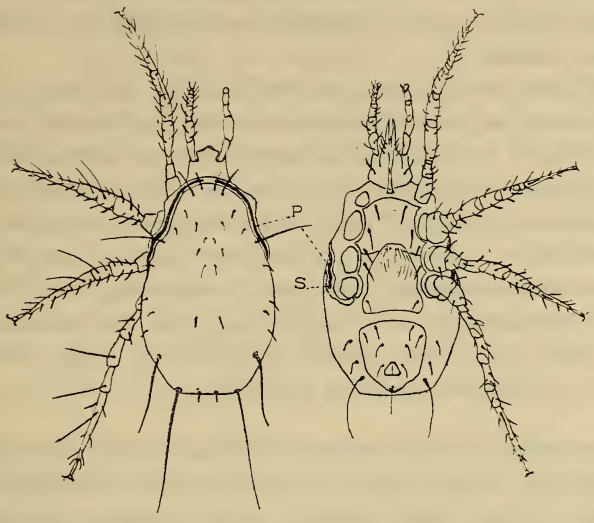

Fig. 5.—*Leiulus truncatus,* Oudms.; female; dorsal and ventral side; S=stigma; P=peritrema.—Original.—**A useful species.**

dorsally by the *epistome,* the anterior edge of which is characteristic for almost every species. This epistome is fused with the maxillæ on both sides, forming thus a *camerostome* around the mandibles. The palps are filiform.

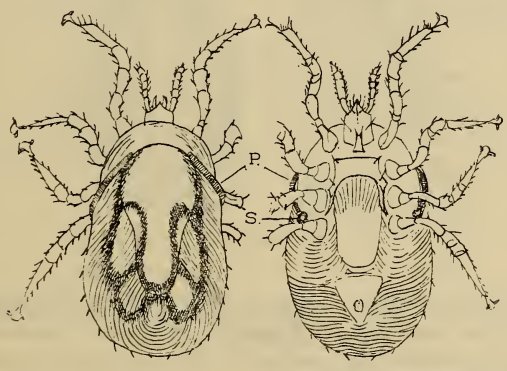

Fig. 6.—*Dermonyssus gallinæ* (de Geer); female; dorsal and ventral side; S=stigma; P=peritrema.—Copied from Mégnin, Les paras. et les malad. paras., tab. 1; 1880.—**A noxious species.**

The legs are generally slender, and placed contiguously on each side; the second pair of legs is generally thicker in the males. The genital aperture in both sexes lies far forward; in the males before the sternal shield, in the

females between the sternal and genital (striated) shield (figs. 5 & 6). The sperm is packed in a minute vesicle or spermatophore in the shape of an old-fashioned purse. The male effects impregnation by grasping one of these spermatophores with his own mandibles and placing it within the genital aperture of the female.

It is superfluous to mention here the families into which the group is divided. We need only draw attention to the LÆLAPIDÆ, many species of which are our friends or auxiliaries, as they devour all kinds of mites which are noxious to cultivated plants (fig. 5); and to the DERMONYSSIDÆ, many species of which infest our birds (fig. 6) and occasionally even mankind.

The MESOSTIGMATA are easily collected by sieving decaying leaves, by drawing a net over low herbage or grass, by brushing dead birds and small mammals, by inspecting with a magnifying glass the underside of leaves, the bark of trees, etc. They should be picked up with a soft moistened paint-brush and should be preserved in alcohol.

(5) PARASTIGMATA, or UROPODOIDEA (Stalked Mites), are always smaller than one millimetre, almost circular or oval in shape, light to dark brown in colour, ventrally almost flat, dorsally usually convex, and slow in their movements.—Their stigmata lie between the second and third pairs of legs,

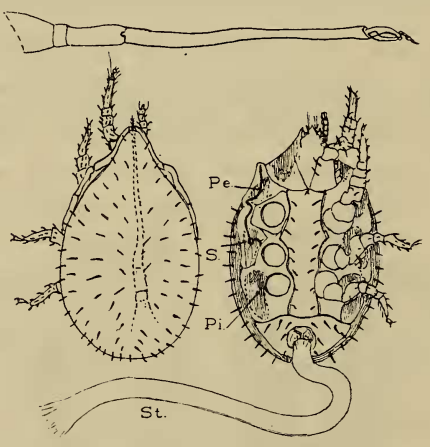

Fig. 7.—*Uropoda africana*, Oudms.; deutonymph.—To the left: dorsal side, through which the extremely long mandibles are discernible (only one is delineated). To the right: ventral side; S=stigma; Pe=peritrema; Pi=leg-pits; St=stalk. Above: mandible.—Original.—**Useful species.**

and a long serpentine air-containing *peritrema* is always present. The dorsal view in the accompanying figure of *Uropoda africana* (fig. 7) indicates the position of one of the very long exsertile mandibles, when completely withdrawn within the body. These nipper-like mandibles enable the mites to seize their prey at some distance. Their food consists usually of other mites

still smaller than themselves, and as these are for the most part injurious to plants, the PARASTIGMATA must be considered as useful organisms.—They are to be found everywhere, especially among low herbs, grass and decaying leaves, but also on the undersides of growing leaves, which often swarm with noxious mites. Their biology and anatomy are almost the same as those of the foregoing group, to which they are closely related, with this exception, that they do not occur on mammals or birds, nor in groceries. When the nymphs (eight-legged immature stage) use Insects as a means of transport (see above, section 4), they attach themselves upon them by means of a pellucid elastic stalk, which is formed by a secretion from two stalk-glands, flanking the anus ; hence the name of UROPODOIDEA, or Stalked Mites. The legs are short and can generally be fitted into depressions or pits on the ventral side of the body (fig. 7). If the mites are found attached to Insects either the whole insect should be preserved in spirits, or the mites may be carefully scraped off with a small knife and preserved alone.

(6) HETEROSTIGMATA are minute, transparent, rarely rose or orange-coloured, extremely weak creatures, with stinging and sucking mouth-parts. As the males lack stigmata, the name of HETEROSTIGMATA is proposed for this group. Those of the females are situated between the first pair of legs

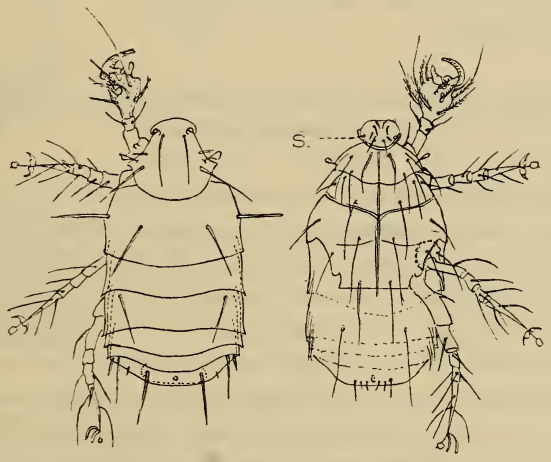

Fig. 8.—*Pediculoides spinosus* (Kramer); female; dorsal and ventral side; S=stigma. Original.—**Noxious species.**

and the maxillæ. Their eight legs are placed in four groups of two.—They all suck plant-juices ; so they are, if they occur in abundance, which is often the case, exceedingly noxious to cultivated plants, and if they have the opportunity to crawl upon men, they cause a most insupportable itching and redness of the skin (erythema).—The pregnant females become enormously distended. They exhibit an anatomical peculiarity in possessing what are

known as *pseudostigmata*, i. e., a pair of more or less cup-shaped organs in the neck, out of which emerges a sense-hair (in this case often club-shaped), called the *pseudostigmatic organ*.—Sometimes they migrate by attaching themselves to the hairs of small mammals (rats, mice, moles, weasels) or flying insects, for which their fore-legs are specially adapted. When found on animals they may be picked up with a moistened paint-brush ; but if they occur on leaves, or ears of corn, the portion of the plant should be cut off and placed bodily in spirits.

(7) Stomatostigmata is the name of a small group of Acari, found among dead or decaying leaves, on which they apparently feed ; for their mandibles are very short, but stout, and not protrusive. Their body is well chitinised and therefore more or less brown in colour. The arrangement of the legs is very anomalous, all the coxæ being approximated. The presence of two pairs of *pseudostigmata* seems to show a remote relation to the foregoing group. Their size is less than a millimetre, and their stigmata lie between the first and second pairs of mouth-parts. Their movements are slow. Hitherto they have only been found in the Northern Hemisphere.

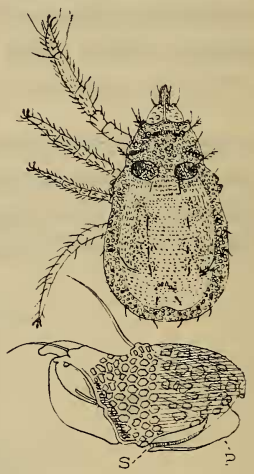

Fig. 9.—*Labidostoma denticulatum* (Schrank) ; female ; dorsal side and mandible ; S = stigma ; P = peritrema.—Original.

(8) To the large group of Prostigmata belong various kinds of Acari, more or less related to one another. They vary from one-fifth to ten millimetres in length. With only one or two exceptions they are weak creatures, being white, yellowish, rose or red in colour, rarely green or black. Their stigmata, or the rudiments of these spiracles, lie between the mandibles and the *epistoma* (a more or less prominent frontal lobe). Their food consists of plant-juices, blood, dead or living vegetable matter, or other smaller animals ; the mouth-parts varying according to the diet. The presence of one or two pairs of *pseudostigmata* shows their relation to the five foregoing groups. The legs are generally placed in four groups of two. This group is readily divided into three sections.

(*a*) Prostigmata Eleutherengona are so called because their larvæ are, with only a very few exceptions, free living. Hereto belong, among others, the following families :—The Anystidæ, or Spider Mites (fig. 10), are swiftly running carnivorous Mites, closely resembling minute spiders, and of a red colour ; they often occur in our houses, especially in garrets, but also on different plants ; and as they prey especially on Mites, which in our

houses are at least troublesome, and on plants noxious, these creatures are very useful.—The Pterygosomidæ, or Gecko Mites, are flat, orange, red or crimson coloured parasites, infesting Geckos.—The Tetronychidæ, or

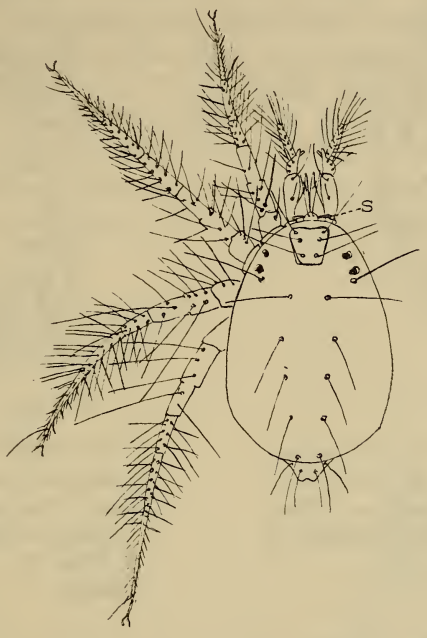

Fig. 10.—*Tarsotomus parietinus* (Herm.); female; dorsal side; S = stigma.—Original.
A very useful species.

Spinning Mites (fig. 11), are slowly moving, green, yellow, orange or red creatures, which are exceedingly noxious to plants, as they suck their juices and increase considerably in favourable seasons. The red species are commonly known as "Red Spiders" in Germany and in America. They spin beautiful bowers in the angles of the leaf-nerves, but when they are in great quantities and the nights are long and cold, they spin together an extremely fine and shining tissue which envelops whole branches, twigs and leaves. Their legs terminate in four nail-shaped claws; hence the name of *Tetronychus*.—The Cheletidæ are quickly running voracious creatures with enormous prehensile maxillary palps (fig. 12). As they suck to death all kinds of mites, noxious to our plants and to our victuals, we must reckon them among our best friends. Like the foregoing Family they lack stigmata, but possess long membranous peritremata.—The Myobiidæ, or Mouse Mites (fig. 13), are sluggish white creatures, which only suck lymph, and may be in some instances very troublesome to small mammals, including bats, as they attach themselves with their lancet-shaped mandibles preferably on tender parts of the skin, *e.g.* the eye-lids, lips, arm-pits, etc.—The Bdellidæ, or Snouted

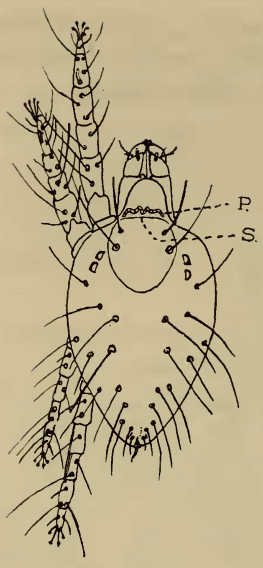

Fig. 11.—*Tetronychus carpini*, Oudms.; dorsal side; P = peritrema; S = closed stigmata.— Original. **A species very noxious to plants.**

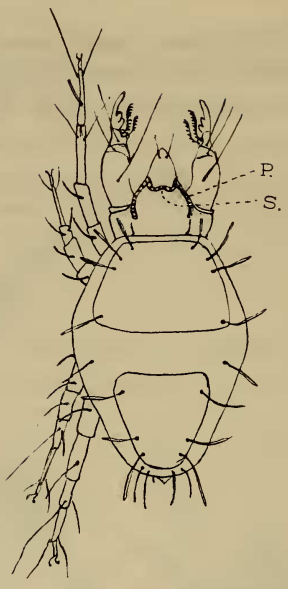

Fig. 12.—*Cheletes eruditus*, Schrank; a cosmopolitan species; female; dorsal side; P = peritrema; S = closed stigmata.—Copied from Oudemans, in Tijds. Ent. v. 46, 1904, tab. 13.— **Useful.**

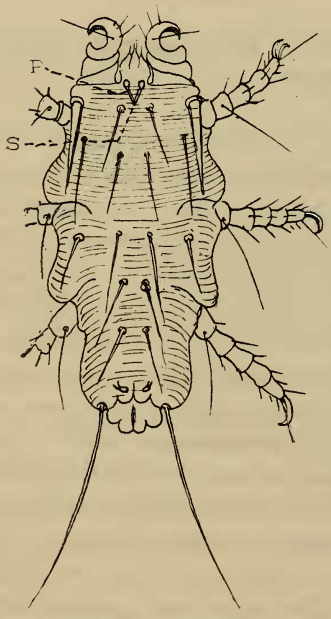

Fig. 13.—*Myobia affinis*, Poppe; female; dorsal side; S = closed stigmata; P = peritrema.—Copied from Mégnin, Les paras. et les malad. paras., t. 24; 1880.

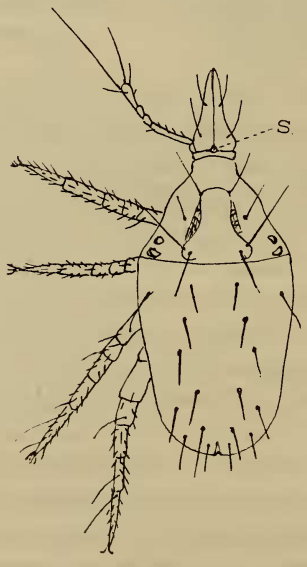

Fig. 14.—*Bdella rubra*, Lam., dorsal side; S = stigmata.—Original.— **Useful.**

Mites (fig. 14), are generally slowly moving, but occasionally quick-running, predaceous creatures, usually of a red colour, and feeding on all kinds of soft-bodied Mites, which are to be found on plants and under the bark of trees.

(*b*) Prostigmata Parasitengona are so called because the larvæ are parasites, whereas the nymphs and adults are predaceous. Their very interesting, red-coloured larvæ are often to be found infesting gnats, water-bugs, water-beetles, all kinds of land-beetles, bugs, grasshoppers, spiders, frogs, birds, bats, and small mammals. In many instances they have no economic significance, but as in some cases they cause the death of mosquitoes and other noxious insects, they must to that extent be considered beneficial.

A figure is given here of one of the grasshopper-parasites (fig. 15). In hot

Fig. 15.—*Euthrombidium trigonum*, Herm.; larva; dorsal side.—Copied from Berlese, Ordo Prostigmata, tab. 13, 1893, a little altered.—**Useful.**

Fig. 16.—*Hydryphantes ruber*, de Geer; larva; dorsal side.—Copied from Oudemans, in Tijds. Ent. v. 46, tab. 1; 1904.—**Useful.**

summers, especially during the harvest time, they may abound, and in this instance they may be exceedingly troublesome to man. Thus in the Guianas the "batata-mite," in Mexico the "tlalzahuatl," in France the "rouget," in England the "harvest-mite," in New Guinea and Celebes the "gonone," are well known plagues. They burrow into the skin and cause intolerable itching and painful little blisters. To this section belong the slowly moving, generally scarlet and velvety, Harvest Mites (Thrombidiidæ), which live free, preying on smaller weak creatures, gnats and flies, and living on the ground, on trees, or on herbs; it includes also the well known, generally globular, red or green Water Mites (Hydrarachnidæ); and finally the quickly running, red or brown coloured Tufted Snout Mites (Erythræidæ).

(*c*) Prostigmata Pleuromerengona are so called because the limbs are planted at the sides of the body and not beneath it, being an adaptation to a marine life. They occur not only near the shore, but also at great depths, generally living among seaweed, upon which they crawl with facility. When the waves sweep them upwards from their natural haunts, they spread out their limbs, which in many cases are provided with beautiful horizontal fans, so that they gently sink again to the bottom. They suck both animal and vegetable juices, and may be obtained by means of fine-meshed scoop-nets, or by cautiously picking them out of a handful of seaweed placed in a bowl with sea-water.

(9) Octostigmata, or Oribatoidea (Beetle Mites), are generally oval or circular in shape, less than one millimetre in length, light or dark brown in colour, ventrally more or less flat, dorsally more or less convex, with a somewhat hard and shining integument (hence the name Beetle Mites), and slow in their movements. The stigmata are generally eight in number, and lie in the soft skin of the acetabulum or socket, which holds the basal joint (coxa) of the leg. The creatures live free among dead and decaying leaves, among grass, in mosses and lichen, upon and beneath the bark of trees, and very often shelter under stones; they are generally vegetarian in their diet, feeding especially on the hyphæ, mycelium and spores of fungi; therefore their mandibles are not protrusive and are provided only with short claws. But there are a few species (*Pelops*) which have long exsertile mandibles, so that acarologists suspect them of being predaceous. A pair of pseudostigmata seems to indicate a relation to the foregoing groups, but in the majority of the species the legs are placed in two continuous rows, one on each side. Of their pairing nothing is known. They resort to the well known and widely distributed trick of shamming dead on the approach of danger. It has often happened that a roof of a house, or the trunks of the trees of an orchard have been found to be swarming with Beetle Mites, to the great fright of the inhabitants or of the owners; but it has been proved that the creatures are perfectly harmless.

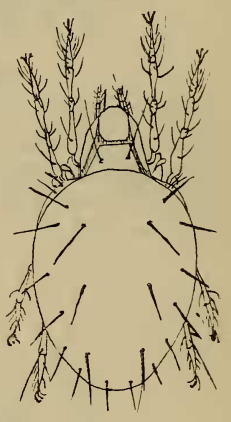

Fig. 17.—*Eremæus hessei*, Oudms.; an African species; dorsal side.—Copied from Oudemans, in Tijds. Ent. v. 45, tab. 12; 1903.

(10) Astigmata, or Acaroidea, is the name of a large group of generally minute creatures (*akarēs* = indivisible); they are weak, white or pale, generally oval in shape, rarely compressed, but plump and more or less cylindrical. All are slow in their movements, and they lack stigmata.

Many live free and feed on fresh or dead animal or vegetable substances; others are parasitic on mammals or birds; others feed only on hairs or feathers. Hence they are found literally everywhere. Generally their mandibles are short, not protrusive, and end in short and stout nippers, like those of a lobster. Their palps are generally filiform and short. Their legs are short, in some instances extremely short, or even rudimentary, and are arranged in four groups of two each, like in the foregoing group, to which they are very closely related. The female genital aperture is generally placed far forward, that of the male behind the middle of the ventral surface. The following curious facts are worth noting.

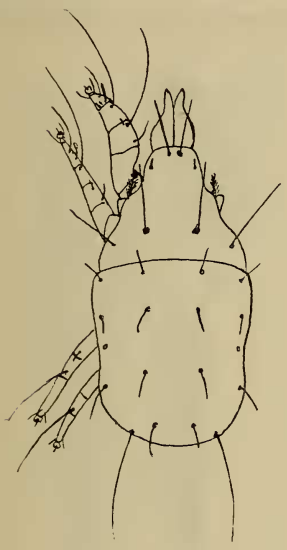

Fig. 18.—*Aleurobius africana*, Oudms.; female; dorsal side. Original.

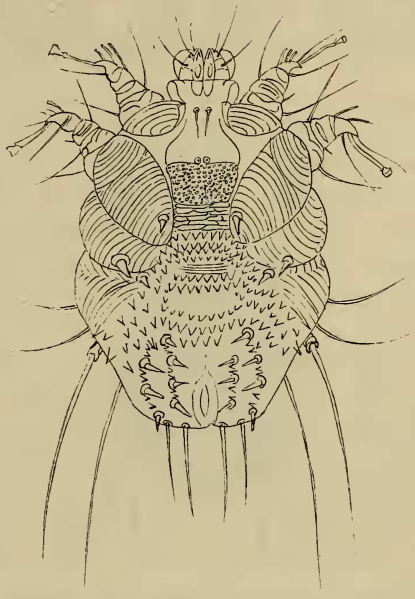

Fig. 19.—*Sarcoptes equi*, Gerl.; female; dorsal side.—Copied from Mégnin, Les paras. et les malad. paras., tab. 9; 1880. **A noxious species.**

As in LEPIDOPTERA, the females, or rather the female deutonymphs, are provided with a special copulatory opening or projecting tube, and the males generally pair not with the mature females but with the deutonymphs. In these cases the nubile deutonymphs only develop into mature females after fertilization. To this group belong, among others, the following Families: the TYROGLYPHIDÆ (Cheese Mites), which may be found on all kinds of animal and vegetable victuals (fig. 18), in decaying leaves, in mosses, in mushrooms, etc. Sometimes they abound in houses, stores, churches, etc., swarming in such numbers as to cause considerable annoyance. In most of these instances they have been introduced in the so-called vegetable horse-hair (vegetable fibres from Halfa-grass and dwarf-palms), and soon disappear.

The Listrophoridæ (Hair-Clasping Mites) attach themselves to the hairs of small mammals by means of clasping organs, consisting of deformed maxillæ or legs. The Acaridæ, or Sarcoptidæ (True Itch Mites), burrow under the epidermis of their hosts (birds and mammals) with their extremely short mole-like feet and their short lobster-claw-shaped mandibles (fig. 19). They are liable to attack both human beings and domesticated animals, causing scabs and intolerable itching. The Feather Mites (Dermoglyphidæ and many other Families) live especially on birds, feeding only on feathers. In winter they often shelter in the quills, or, transformed into short-legged, weak, cylindrical bodies, they hibernate in the nostrils, the tracheæ and bronchi, or the lungs and air-sacs of their hosts. When these mites are discovered upon a bird, infected portions of the feather should be cut off and at once preserved in

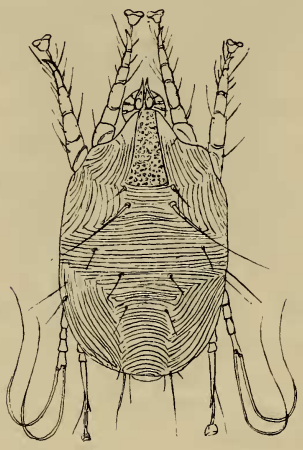

Fig. 20.—*Chorioptes spathiferus*, Mégnin; female; dorsal side.—Copied from Mégnin, Les paras. et les malad. paras., tab. 18; 1880.—**A noxious species.**

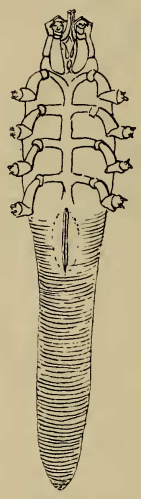

Fig. 21.—*Demodex canis*, Leydig; female; ventral side.—Copied from Mégnin, Les paras. et les malad. paras., tab. 26; 1880. **Sometimes noxious.**

alcohol. The Psoralgidæ (False Itch Mites) never burrow beneath the skin, but merely pierce it with their conical mouth-parts (fig. 20); nevertheless they also produce scabs and intolerable itching. On our domestic animals, especially hoofed animals, they cause the well-known hoofscurf. Their legs are long.

(11) Lipostigmata, or Demodicidæ (Sebacic Mites), are very elongate club-shaped, transparent, extremely minute mites, which have eight very short mole-like feet on the "club" (fig. 21); this club contains only the

muscles of the mouth-parts and feet, the brain and the salivary glands. The tail-shaped body contains the entrails proper. They live in the sebaceous sacs and hair-follicles of all kinds of mammals, especially in the face. Rarely they cause scurfs. This is a very neglected group, and worthy of more attention. Parts of the attacked skin should be preserved in alcohol. The creatures lack respiratory organs, and most probably they are related to, or perhaps even an earlier stage of, *Psorergates simplex*, which also lives in sebaceous sacs (Family CHELETIDÆ, see above, p. 113).

(12) ZEMIOSTIGMATA, or TETRAPODILI, or ERIOPHYIDÆ (Gall Mites). They are elongate, transparent, minute creatures without respiratory organs, which they have entirely lost (hence the name of ZEMIOSTIGMATA), and with only four anteriorly placed legs (fig. 22). Probably they are most nearly related to, or perhaps even an earlier stage of TETRONYCHIDÆ (see above, p. 113). They generally cause various kinds of "galls," excrescences and deformities of leaves, buds, twigs, etc., within which they live, and which are filled, or covered, with white hairs or down. A few species live free, but always on leaves, especially on the underside. The galls or deformities must be separated from the plant, then set aside in shadow, so that they may dry a little; then cut them into pieces, put them into a wide and short glass tube, closely corked, and placed in a remote corner of the room. After a time it will be observed that all the minute creatures have come together on the window-side of the tube. Uncork the tube, cautiously remove all the pieces, and fill it with spirits. As these mites are extremely delicate, never put the labels into the tube, but paste them outside.

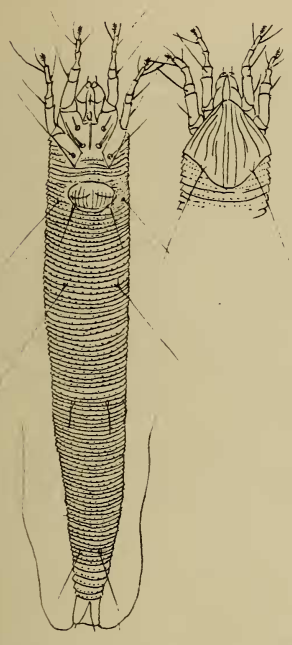

Fig. 22. — *Eriophyes tenuis*, Nalepa; dorsal side of forepart, and ventral side of entire creature.—Copied from Nalepa, Phytoptida, in Denk. Ak. Wien, 1891, tab. 1.